

APPENDIX A

'920 Patent Claims	Chinese Patent Publication No. CN 20122011Y to Honggang (Exhibit T)
<i>Claim 1</i>	
A system comprising:	Honggang discloses a system.
a controller device;	<p>Honggang's system includes a remote controller device:</p> <p>"The toy ball comprises a housing, a mobile body arranged on the housing and a remote control device." Abstract (emphasis added).</p> <p>"A novel toy ball comprises a housing, a mobile body arranged on the housing and a remote control device." Claim 1 (emphasis added).</p> <p>"When playing with the toy ball, children can freely enable the ball to roll, turn, stop or swing through remote control commands." p. 3 (emphasis added).</p>
a self-propelled device comprising a spherical housing,	<p>Honggang's system includes a self-propelled toy ball and, among other things, a spherical housing 5:</p> <div data-bbox="604 957 1312 1524" data-label="Image"> </div> <p style="text-align: center;">Fig. 1 Honggang</p> <p>(emphasis added)</p> <p>"When playing with the toy ball, children can freely enable the ball to roll, turn, stop or swing through remote control commands." p. 3 (emphasis added).</p>

a drive system provided within the spherical housing,

Honggang self-propelled toy ball includes a drive system contained inside its spherical housing 5. The drive system includes two wheels 8, universal wheel 12, and two motors 13:

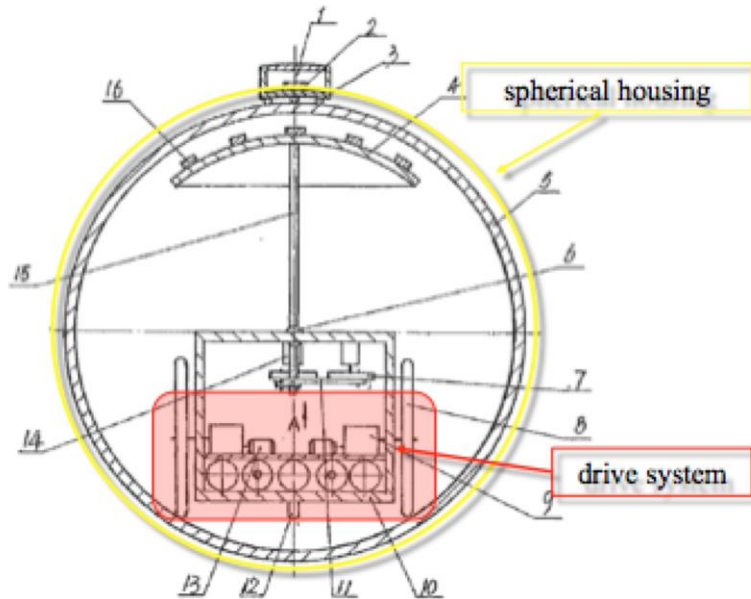


Fig. 1
Honggang

(emphasis added)

“A remote control tricycle is arranged in the housing (5), wherein the tricycle is composed of wheels (8), two motors (13), a pendulum (15), a first magnet (16), a universal wheel (12) and signal receiving devices; the wheels (8) are arranged on both sides of a frame (10), the two motors (13) are arranged on the frame and drive the two wheels respectively by retarding mechanisms (9)” Abstract

“In Figures 1 and 2, a remote control tricycle is arranged in the housing 5; the tricycle is composed of the wheels 8, the universal wheel 12, the two motors 13 wherein the wheels 8 are arranged on both sides of the frame 10, the universal wheel 12 is arranged at the front end of the frame, and the two motors 13 are fixed on the frame 10 and drive the left and the right wheels 8 to rotate respectively by the two retarding mechanisms 9” pp. 3-4.

one or more
magnetic
components,

Honggang self-propelled toy ball includes magnetic components 16:

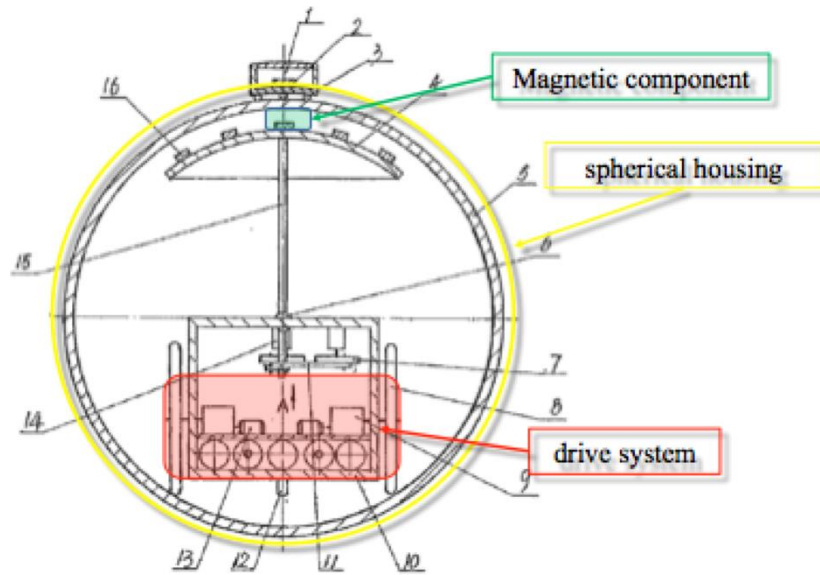


Fig. 1
Honggang

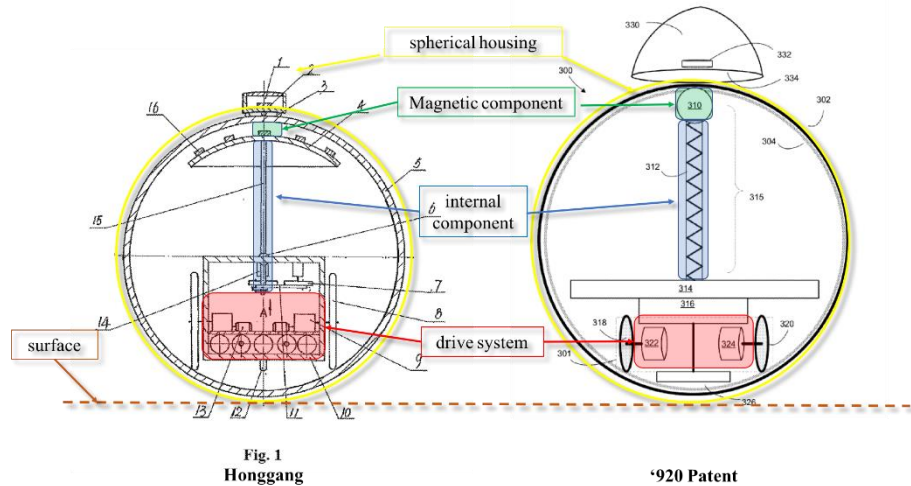
(emphasis added)

“A remote control tricycle is arranged in the housing (5), wherein the tricycle is composed of wheels (8), two motors (13), a pendulum (15), a **first magnet (16)**, . . . and the pendulum (15) is arranged atop the frame with a tray (4) on the top; **the first magnet (16) is fixed on the tray**”
Abstract (emphasis added)

“The opposing surfaces of the second magnet(s) 2 and **the first magnet(s) 16** are magnetically opposed to each other.” p. 4 (emphasis added)

and an internal component that extends from the drive system to position the one or more magnetic components within an interior of the spherical housing, so as to be diametrically opposed to a point of contact between the spherical housing and an underlying surface;

Honggang's magnetic components 16 within the spherical housing 5 are positioned at the inner top of the sphere by an oscillating bar 15 (i.e., "internal component") as shown in Figure 1. As shown by the following side-by-side comparison of Figure 1 of Honggang with Figure 3 of the '920 Patent, Honggang's internal component 15 extends from the drive system to position the magnetic components 16 within the interior of the spherical housing 5, so as to be diametrically opposed to a point of contact between the spherical housing and an underlying surface:



(emphasis added)

an accessory device comprising one or more magnetic components

Honggang's self-propelled toy ball has a mobile body 1 as an accessory device. The mobile body has a magnetic component 2.

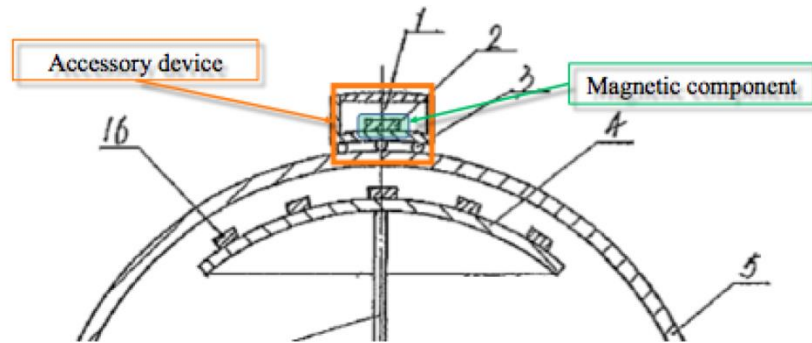


Fig. 1 (emphasis added)

“The toy ball comprises a housing, a mobile body arranged on the housing and a remote control device. . . . A second magnet (2) is arranged in the mobile body (1).” Abstract

“One or a plurality of mobile bodies 1 within which are provided with one or a plurality of second magnets 2 are arranged on the housing 5. The opposing surfaces of the second magnet(s) 2 and the first magnet(s) 16 are magnetically opposed to each other. In order to reduce friction, a plurality of beads 3 can be arranged on the bottom surface of the mobile body(ies) 1.” p. 4

and a contact surface having a radius of curvature that conforms to an exterior surface of the spherical housing,

The bottom surface of Honggang's mobile body 1 is concave to correspond to the outside of the sphere. The two surfaces complement each other when the mobile body is mounted to the housing 5. The mobile body 1 is shaped to correspond to the outside of the sphere:

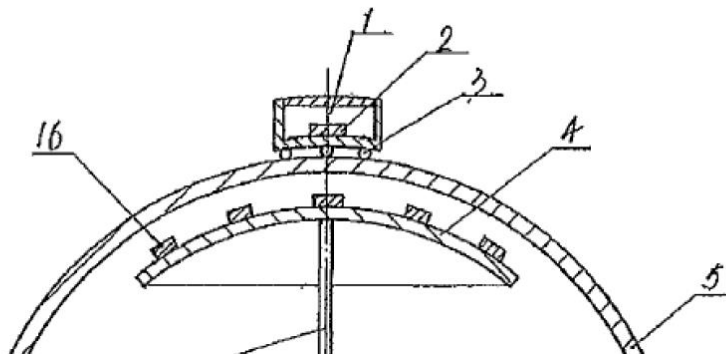
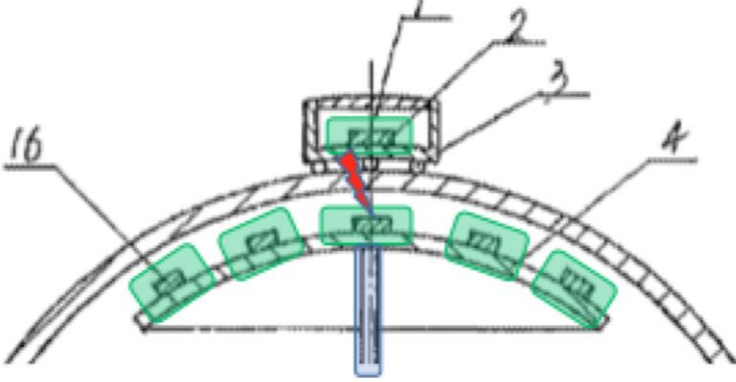


Fig. 1

<p>the contact surface of the accessory device being positionable along the exterior surface of the spherical housing to cause a magnetic interaction between the one or more magnetic components within the spherical housing and the one or more magnetic components of the accessory device;</p>	<p>The contact surface of Honggang's mobile body 1 is positionable along the exterior surface of the spherical housing 5. This causes a magnetic interaction between the magnetic components 16 within the spherical housing 5 and the magnetic component 2 of the mobile body 1.</p>  <p>(emphasis added)</p> <p>“The toy ball comprises a housing, a mobile body arranged on the housing and a remote control device.” Abstract (emphasis added)</p> <p>“One or a plurality of mobile bodies 1 within which are provided with one or a plurality of second magnets 2 are arranged on the housing 5. The opposing surfaces of the second magnet(s) 2 and the first magnet(s) 16 are magnetically opposed to each other.” p. 4.</p>
<p>wherein the drive system is operable under control of the controller device to cause the spherical housing to maneuver, including to roll on the underlying surface,</p>	<p>A user can manipulate Honggang's remote controller to operate the drive system inside the sphere, thereby rolling the sphere along a surface.</p> <p>“The toy ball comprises a housing, a mobile body arranged on the housing and a remote control device. A remote control tricycle is arranged in the housing (5), wherein the tricycle is composed of wheels (8), two motors (13), a pendulum (15), a first magnet (16), a universal wheel (12) and signal receiving devices; the wheels (8) are arranged on both sides of a frame (10), the two motors (13) are arranged on the frame and drive the two wheels respectively by retarding mechanisms (9), and the pendulum (15) is arranged atop the frame with a tray (4) on the top; the first magnet (16) is fixed on the tray, the universal wheel (12) is arranged at the front end of the frame (10), and the signal receiving devices are arranged on the frame and respectively control each of the motors.” Abstract (emphasis added)</p> <p>“When playing with the toy ball, children can freely enable the ball to roll, turn, stop or swing through remote control commands.” p. 3 (emphasis added).</p>

<p>the magnetic interaction causing the accessory device to maintain contact with the exterior surface of the spherical housing as the spherical housing rolls;</p>	<p>The interaction between the magnetic components 16 within the spherical housing 5 and the magnetic component 2 in the mobile body 1 causes the mobile body 1 to stay in contact with the exterior surface of the spherical housing 5 as it moves and as the spherical housing rolls.</p> <p>“One or a plurality of mobile bodies 1 within which are provided with one or a plurality of second magnets 2 are arranged on the housing 5. The opposing surfaces of the second magnet(s) 2 and the first magnet(s) 16 are magnetically opposed to each other.” p. 4.</p> <p>“Certainly, the motion trail of the mobile body 1 is also in the same curve as the pendulum 15.” p. 4.</p>
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wherein the drive system, in maneuvering the spherical housing, causes the internal component to angularly displace relative to a vertical axis of the spherical housing,

To the extent Spin Master's BB-8 is found to infringe this claim limitation, Honggang discloses this limitation. Honggang's pendulum bar 15 is coupled to the frame 10 of the drive system via a universal joint 6. The universal joint 6 allows the oscillating bar 15 to move independently of the drive. Honggang's spherical device also includes "low speed motors (14) which are fixed on the frame [of the drive] . . . are connected to the bottom of the bar [15] through turnplates (7) and connecting rods (11)." Claim 2. The arrangement of the low speed motors 14, which are different from the motors 13 drive the wheels of the drive system, the turnplates 7, and the links 11 cause Honggang's internal component 15 to "swing" in a curve (i.e., angularly displace from the vertical):

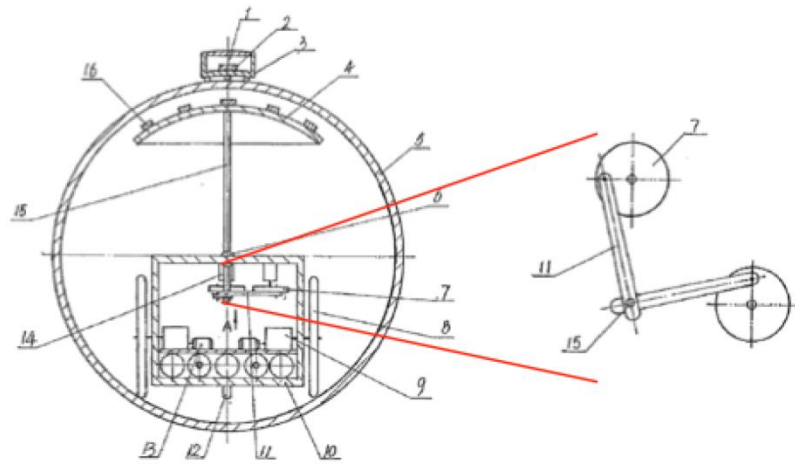


Fig. 1

Figs. 1-2 (emphasis added)

"In Figures 1 and 2, a remote control tricycle is arranged in the housing 5; the tricycle is composed of the wheels 8, the universal wheel 12, the two motors 13, the pendulum 15, the low-speed motors 14, the tray 4 and the signal receiving devices, wherein the wheels 8 are arranged on both sides of the frame 10, the universal wheel 12 is arranged at the front end of the frame, and the two motors 13 are fixed on the frame 10 and drive the left and the right wheels 8 to rotate respectively by the two retarding mechanisms 9; the pendulum 15 is vertically arranged on the frame 10 through the universal joint 6, the low-speed motors 14 are fixed on the frame 10 and are connected to the bottom of the bar through the turnplates 7 and the connecting rods 11, the tray 4 is fixed atop of the pendulum 15 and is provided with the first magnet 16" pp. 3-4

"To increase enjoyment, the toy ball has two low-speed motors 14, two turnplates 7 and two connecting rods 11 which drive the pendulum 15 to swing, and the link lines formed between the two low-speed motor 14 and the pendulum 15 have an angle of less than 180 degrees. When the two low-speed motors 14 simultaneously rotate, the motion trail for the top of the

	<p>pendulum 15 is not in a straight line but in a complicated enclosed curve.” p. 4</p> <p>Based on my understanding as a POSITA, my reading of the entire specification and my analysis, I understand a universal joint is describing a gimbal.</p>
<p>the magnetic interaction causing the accessory device to maintain continuous contact with the exterior surface of the spherical housing when the internal component is angularly displaced.</p>	<p>Through magnetic attraction, Honggang’s mobile body 1 remains in contact with the exterior of the spherical housing 5 as the oscillating bar 15 is angularly displaced.</p> <p>“When the two low-speed motors 14 simultaneously rotate, the motion trail for the top of the pendulum 15 is not in a straight line but in a complicated enclosed curve. Certainly, the motion trail of the mobile body 1 is also in the same curve as the pendulum 15.” p. 4</p>

Claim 19

19. The system of claim 1, wherein the drive system is operable to accelerate or decelerate the self-propelled device to make the internal component angularly displace by a variable tilt angle that is more than 10 degrees with respect to the vertical axis, while the accessory device maintains continuous contact with the exterior surface of the spherical housing.

To the extent Spin Master's BB-8 is found to infringe this claim limitation, Honggang discloses this limitation. Angular displacement of the pendulum bar from Honggang's system relies on low-speed motors 14 that are affixed to the frame 10, each with turnplates 7 that rotate independent of the frame. To each of the two turnplates 7, one end of a connecting rod 11 is mounted at a pivot point at a radial distance from the turnplate's center so that the pivot point rotates with the turnplate 7, and the connecting rod can freely rotate about the pivot point, and parallel to the plane of the turnplate 7. The opposite ends of each of the two connecting rods 11 are mounted to each other at a different pivot point coincident with the end of the pendulum bar 15, so that the connecting rods 11 can freely rotate parallel to the planes of the turnplates 7.

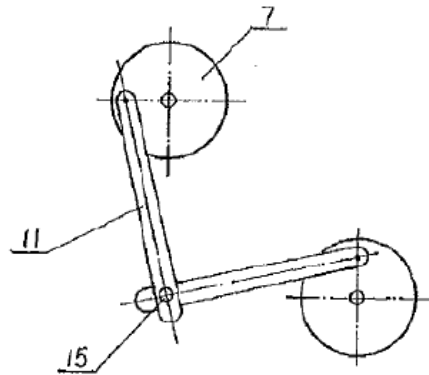


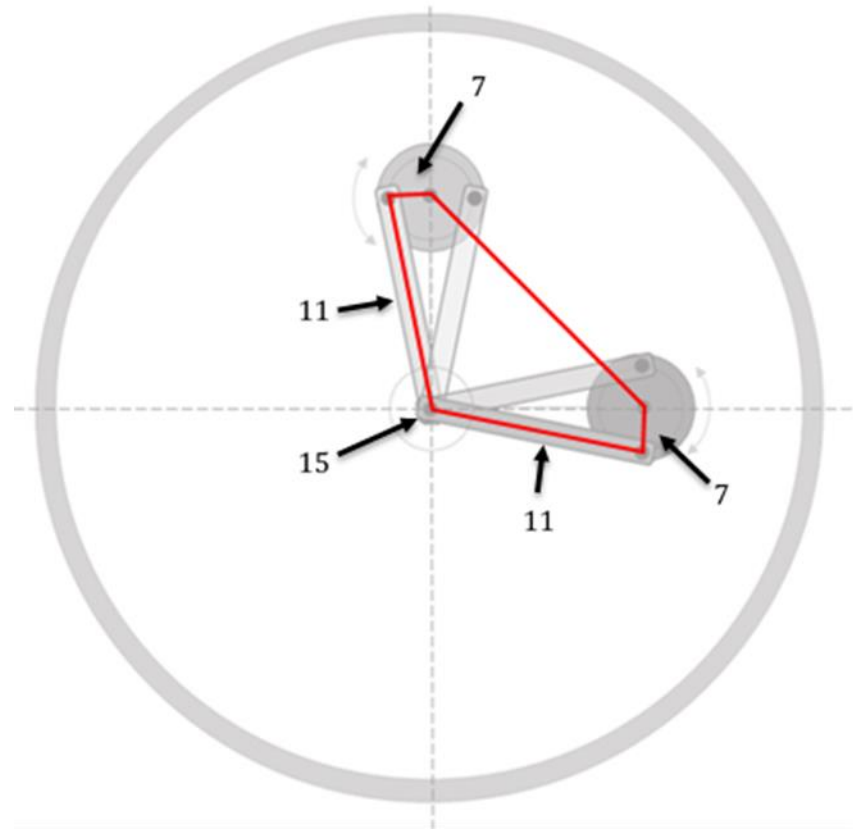
Figure 2

“To increase enjoyment, the toy ball has two low-speed motors 14, two turnplates 7 and two connecting rods 11 which drive the pendulum 15 to swing, and the link lines formed between the two low-speed motor 14 and the pendulum 15 have an angle of less than 180 degrees. When the two low-speed motors 14 simultaneously rotate, the motion trail for the top of the pendulum 15 is not in a straight line but in a complicated enclosed curve.”
p. 4

The system shown in Figure 2 forms a closed kinematic chain comprised of five links:

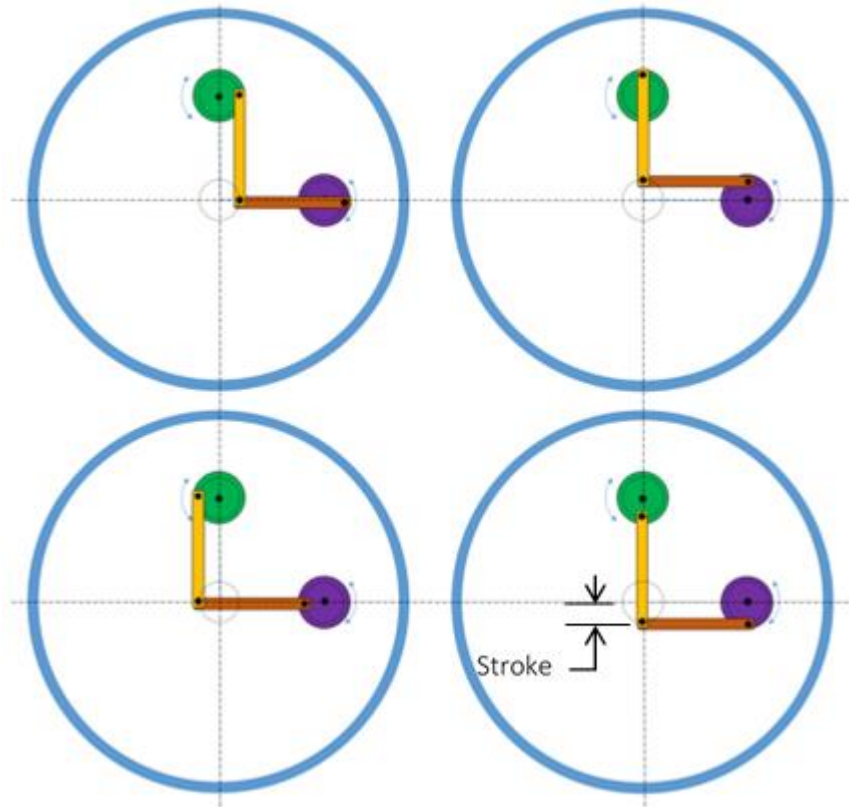
- Two links—the turnplates 7—are drivers with link lengths equal to the radial distance from the turnplate 7 center to the connecting rod 11 pivot point
- One link—the frame—is rigid, with length equal to the center-to-center distance of the turnplates 7
- Two links—connecting rods 11—compliantly rotate parallel to the plane(s) of the turnplates 7, with lengths equal to the distance between the pivot points at each end (one coincident with the pivot

point on the turnplate 7, and the other coincident with the end of the pendulum bar 15).



A POSITA would know, and analysis proves, that the *stroke* of the Honggang pendulum swing drive mechanism (Honggang Figure 2), is defined by the radial distance between the center of the turnplate 7 and the pivot point of the connecting rod 11. This is based on the Honggang's Figure 2, which shows that the turnplates 7 have equal radii, that the connecting rods 11 are of equal length, and that the motors that drive the turnplates 7 are mounted to the frame 90 degrees apart about the vertical axis through the geometric center of the sphere.

The figure below shows the stroke of the Honggang pendulum swing drive mechanism.

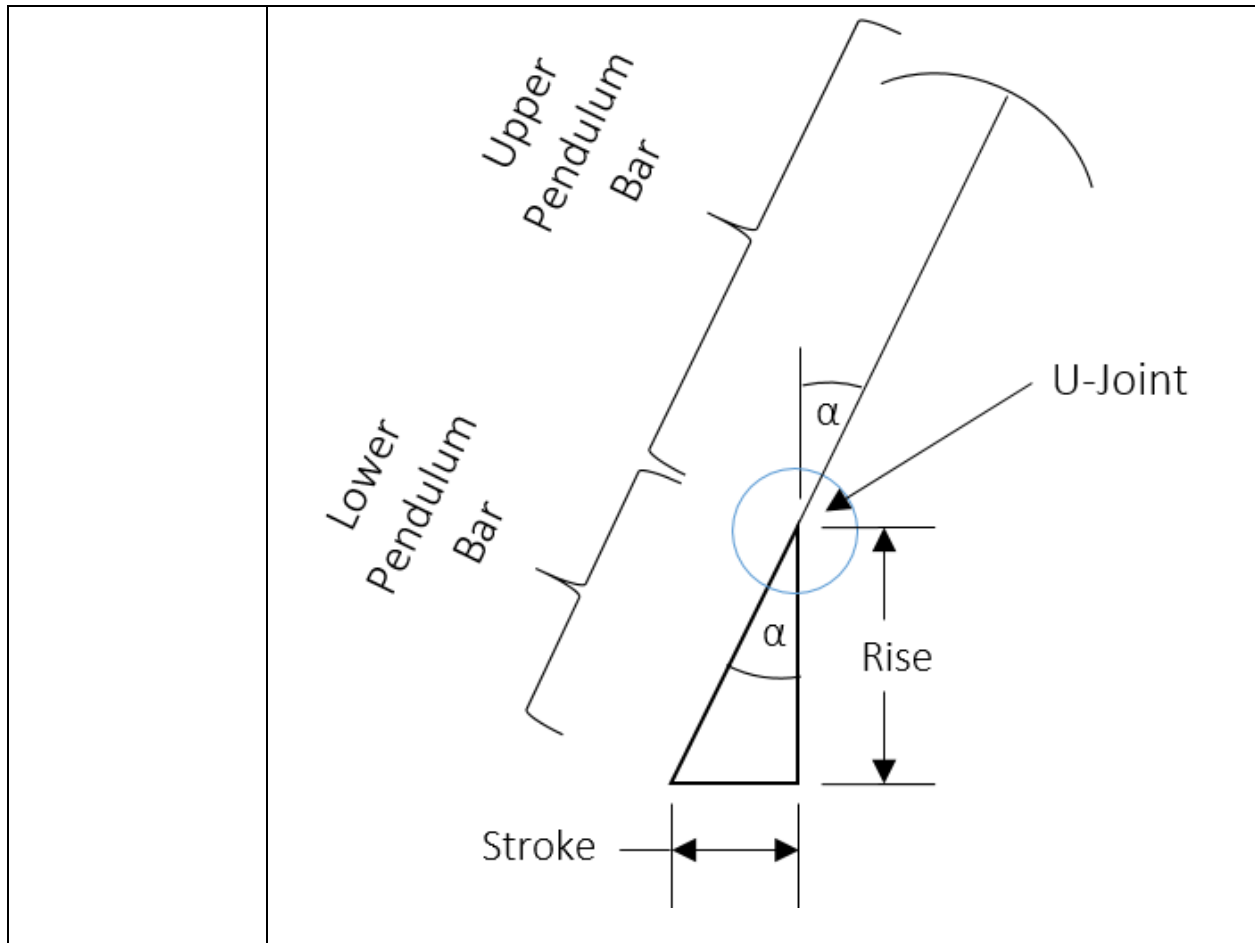


A POSITA would recognize that, for the two connecting rods 11 to drive the pendulum 15 to swing, a geometrically-centered pivot point on frame 10 exists at universal joint 6. The universal joint 6 allows the pendulum bar to pass through the frame and rotate in two degrees of freedom (DOF), pitch and roll, relative to the sphere's lateral axis (pitch) and fore-aft axis (roll).

A POSITA would further recognize that the vertical distance between the center of the universal joint 6 and the plane of the connecting rods 11 defines the vertical leg of a triangle, with the stroke defining the horizontal leg, and lower section of the pendulum 15 defining the hypotenuse. Shown in the figure below, Rise is a constant that describes the vertical separation between the plane of the connecting rods 11 and the universal joint 6. Also shown in the figure below, Stroke is the horizontal separation between the bottom end of the pendulum 15, and the vertical axis of the frame 10. The tilt angle of the pendulum 15, α , is defined as:

$$\alpha = \tan^{-1}(\text{Stroke}/\text{Rise})$$

To satisfy the condition $\alpha > 10^\circ$, the ratio Stroke:Rise need only be greater than 0.176. A POSITA would recognize that this condition is easily satisfied by ensuring that the Stroke is more than 17.6% of the Rise.



Claim 20

20. The system of claim 19, wherein the variable tilt angle is more than 45 degrees with respect to the vertical axis.

To the extent Spin Master's BB-8 is found to infringe this claim limitation, Honggang discloses this limitation. Angular displacement of the pendulum bar from Honggang's system relies on low-speed motors 14 that are affixed to the frame 10, each with turnplates 7 that rotate independent of the frame. To each of the two turnplates 7, one end of a connecting rod 11 is mounted at a pivot point at a radial distance from the turnplate's center so that the pivot point rotates with the turnplate 7, and the connecting rod can freely rotate about the pivot point, and parallel to the plane of the turnplate 7. The opposite ends of each of the two connecting rods 11 are mounted to each other at a different pivot point coincident with the end of the pendulum bar 15, so that the connecting rods 11 can freely rotate parallel to the planes of the turnplates 7.

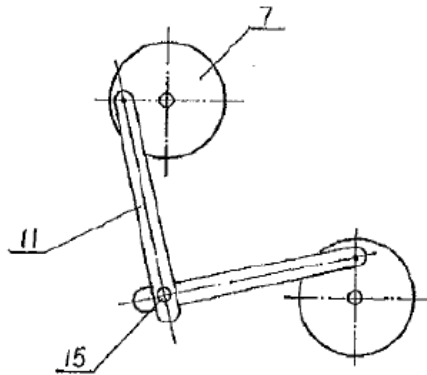


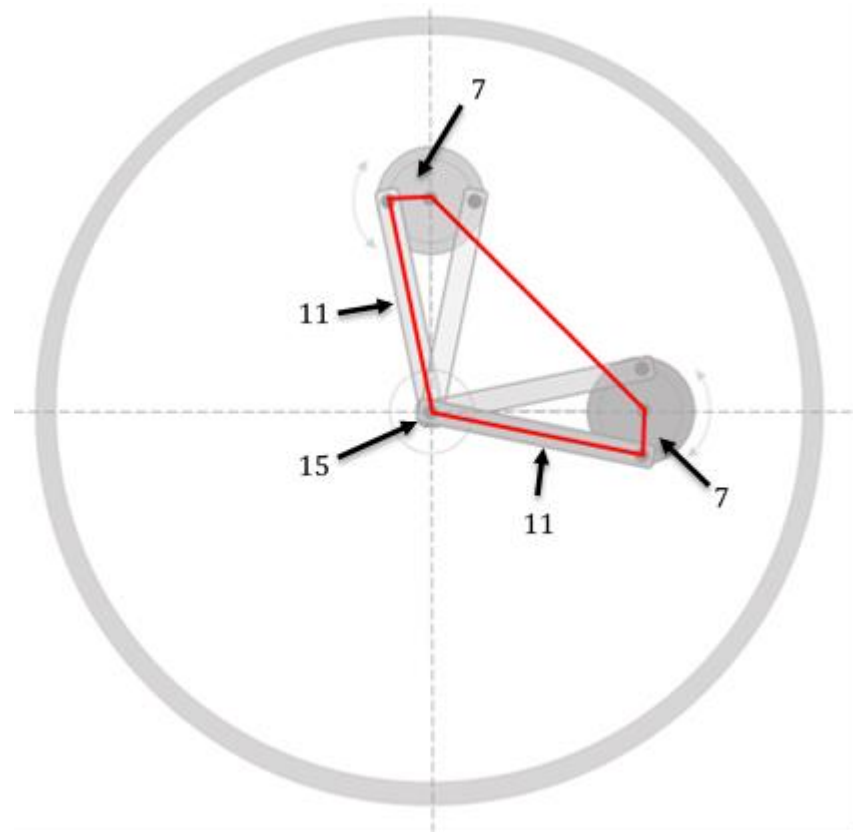
Figure 2

“To increase enjoyment, the toy ball has two low-speed motors 14, two turnplates 7 and two connecting rods 11 which drive the pendulum 15 to swing, and the link lines formed between the two low-speed motor 14 and the pendulum 15 have an angle of less than 180 degrees. When the two low-speed motors 14 simultaneously rotate, the motion trail for the top of the pendulum 15 is not in a straight line but in a complicated enclosed curve.”
p. 4

The system shown in Figure 2 forms a closed kinematic chain comprised of five links:

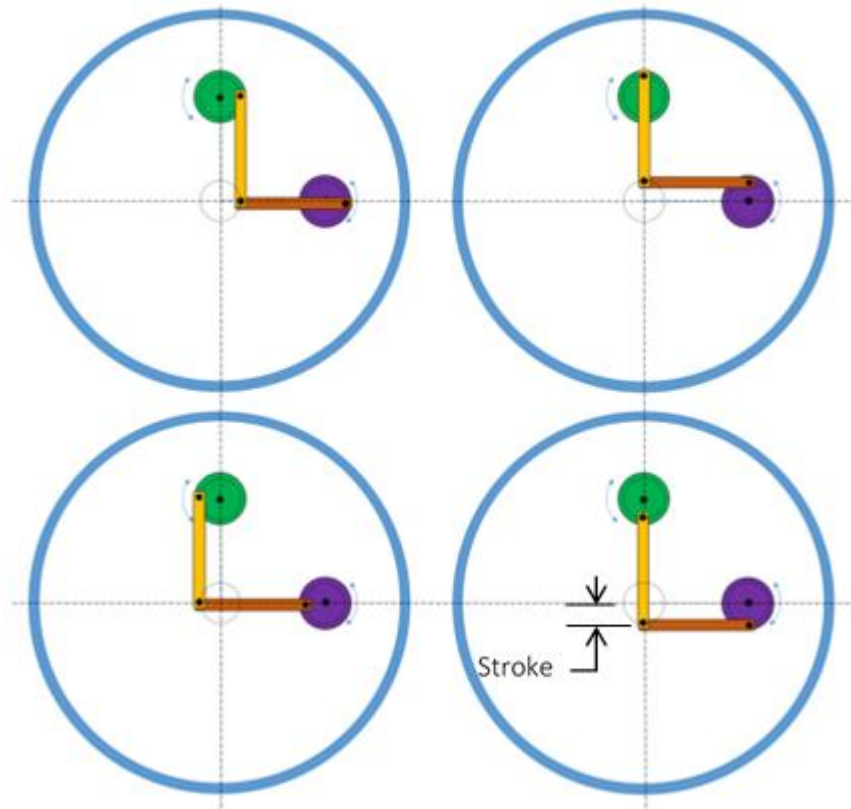
- Two links—the turnplates 7—are drivers with link lengths equal to the radial distance from the turnplate 7 center to the connecting rod 11 pivot point
- One link—the frame—is rigid, with length equal to the center-to-center distance of the turnplates 7
- Two links—connecting rods 11—compliantly rotate parallel to the plane(s) of the turnplates 7, with lengths equal to the distance between the pivot points at each end (one coincident with the pivot

point on the turnplate, and the other coincident with the end of the pendulum bar 15).



A POSITA would know, and analysis proves, that the *stroke* of the Honggang pendulum swing drive mechanism (Honggang Figure 2) is defined by the radial distance between the center of the turnplate 7 and the pivot point of the connecting rod 11. This is based on Honggang's Figure 2, which shows that the turnplates 7 have equal radii, that the connecting rods 11 are of equal length, and that the motors that drive the turnplates 7 are mounted to the frame 90 degrees apart about a vertical axis through the geometric center of the sphere.

The figure below (as well as exhibit 1) shows the stroke of the Honggang pendulum swing drive mechanism.



A POSITA would recognize that, for the two connecting rods 11 to drive the pendulum 15 to swing, a geometrically-centered pivot point on frame 10 exists at universal joint 6. The universal joint 6 allows the pendulum bar to pass through the frame and rotate in two degrees of freedom (DOF), pitch and roll, relative to the sphere's lateral axis (pitch) and a fore-aft axis (roll).

A POSITA would further recognize that the vertical distance between the center of the universal joint 6 and the plane of the connecting rods 11 defines the vertical leg of a triangle, with the stroke defining the horizontal leg, and lower section of the pendulum 15 defining the hypotenuse. Shown in the figure below, Rise is a constant that describes the vertical separation between the plane of the connecting rods 11 and the universal joint 6. Also shown in the figure below, Stroke is the horizontal separation between the bottom end of the pendulum 15, and the vertical axis of the frame 10. The tilt angle of the pendulum 15, α , is defined as:

$$\alpha = \tan^{-1}(\text{Stroke}/\text{Rise})$$

To satisfy the condition $\alpha > 45^\circ$, the ratio Stroke:Rise need only be greater than 1. A POSITA would recognize that this condition is easily satisfied by ensuring that the Stroke is greater than the Rise.

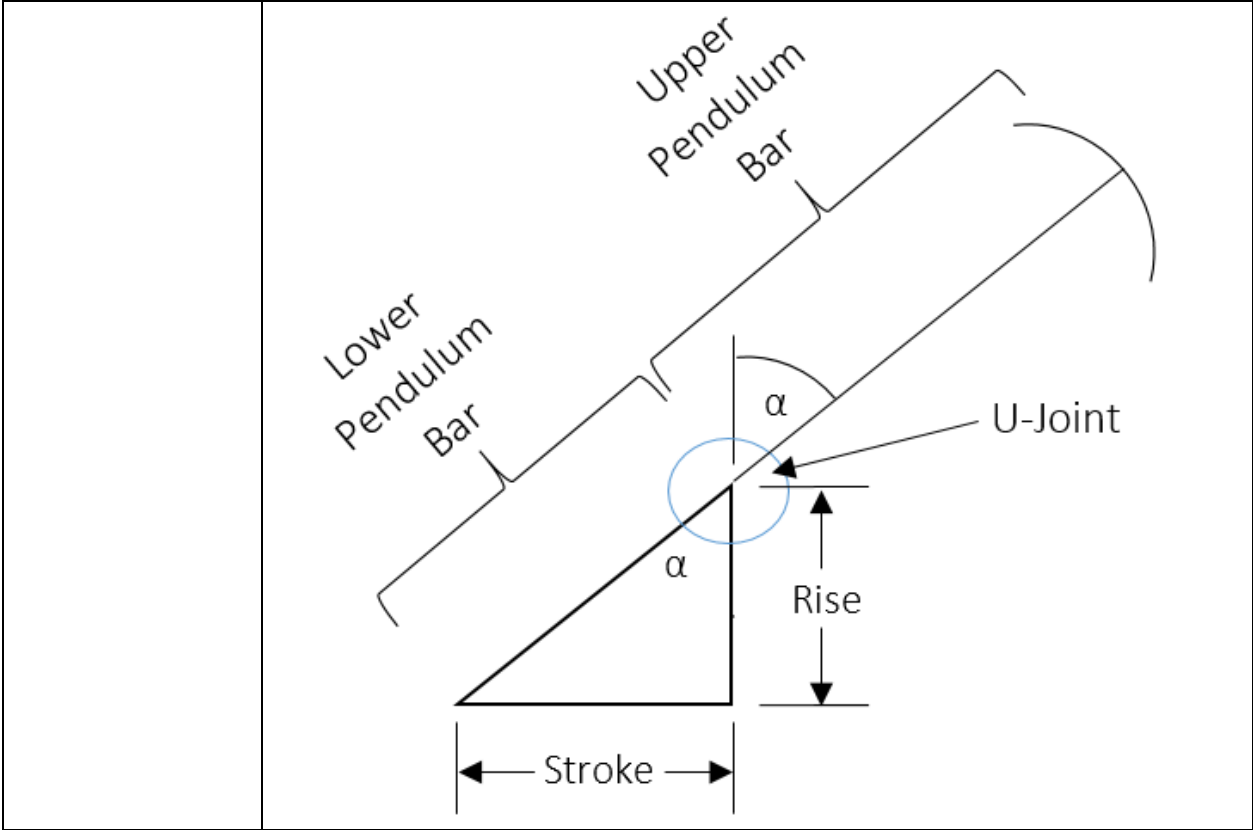
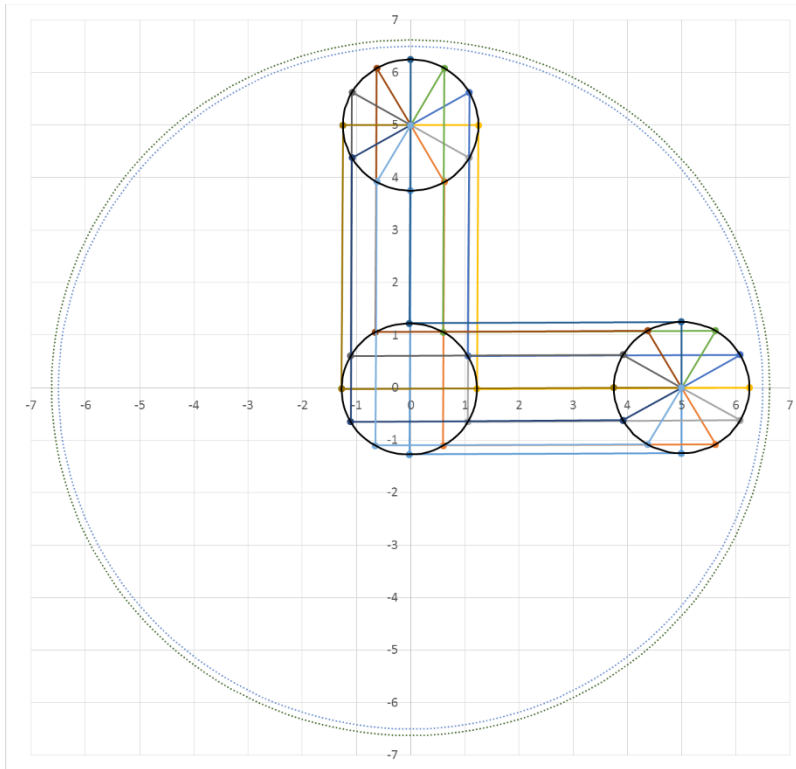


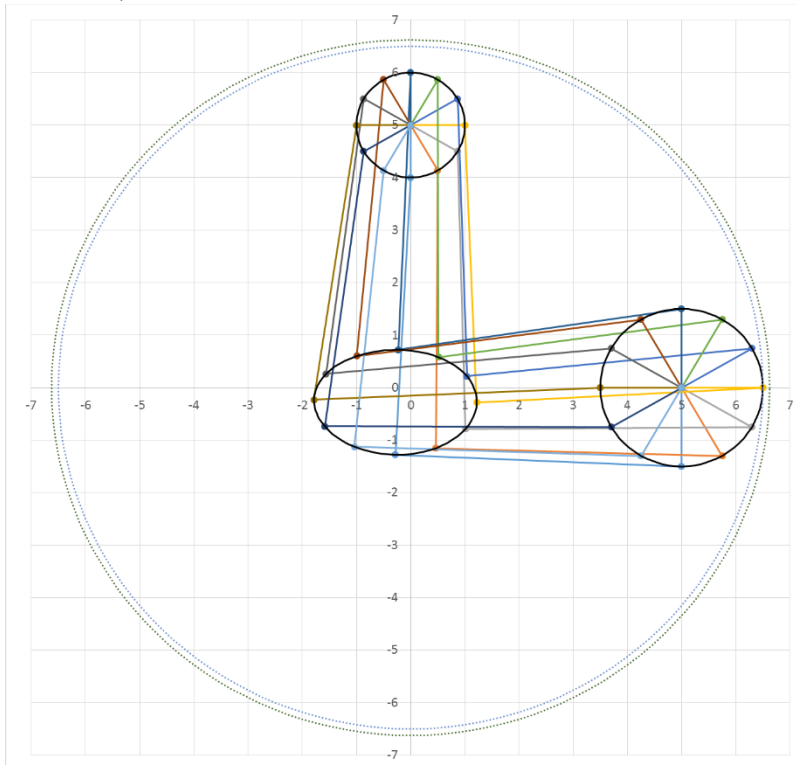
Exhibit 1

5-Bar Trajectory & Stroke Analysis:

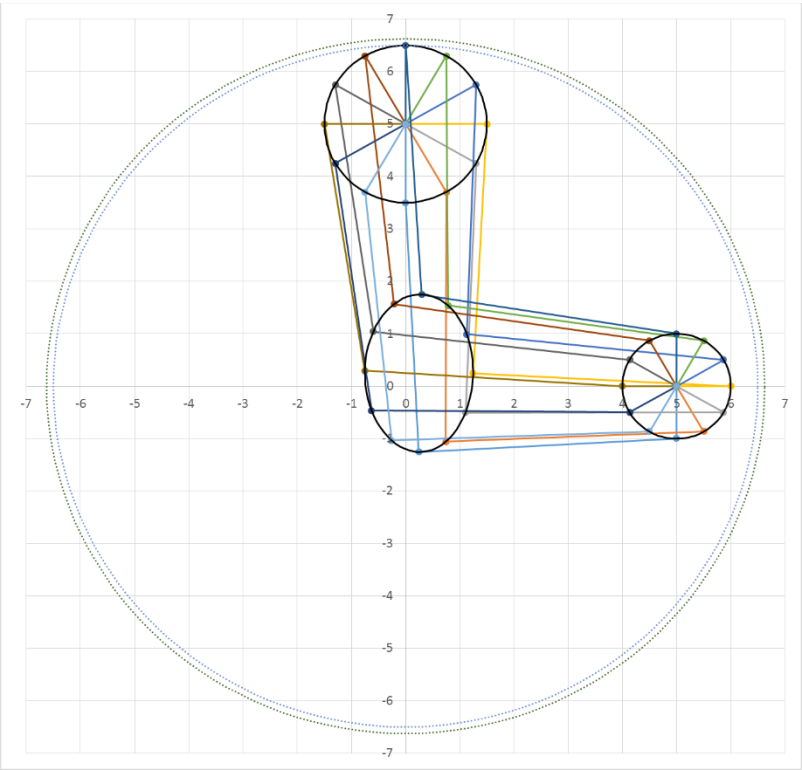
- $R1 = 1.25, R2 = 1.25$:



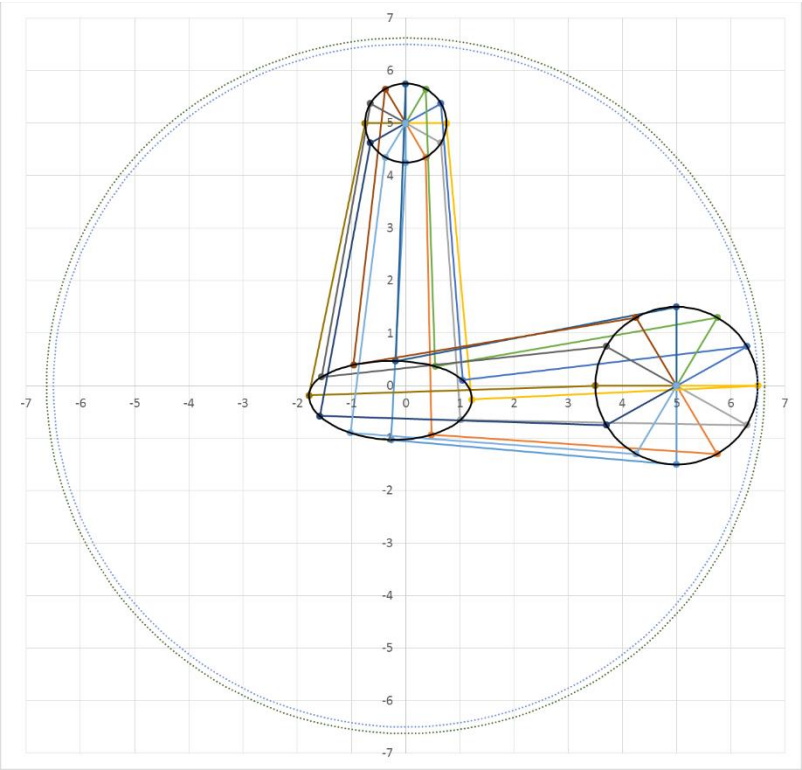
- $R1 = 1.5, R2 = 1$:



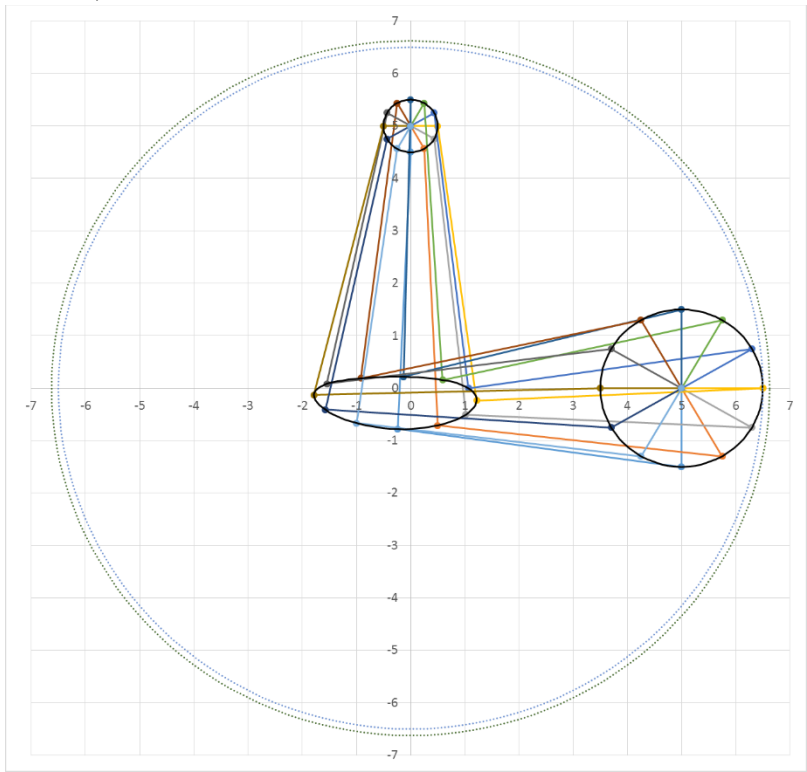
- **$R_1 = 1, R_2 = 1.5$:**



- **$R_1 = 1.5, R_2 = 0.75$:**



- **$R1 = 2, R2 = 0.5$:**



- **$R1 = 1.5, R2 = 0.25$:**

